~~Container, method and device for making a container~~ as well as method and device for filling a container

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Field of the Invention

sub B2 The present invention relates to a container as defined in the preamble to appended claim 1, a method and a device for making a container as defined in the preamble to claims 14 and 22, respectively, and a method and a device for filling a container as defined in the preamble to claims 26 and 29, respectively.

Background Art

Many different kinds of containers for liquid or pulverulent substances are currently available. The containers can either be rigid and made of a rigid material, such as metal, glass, paper or plastic, or be made of a flexible material, usually paper or plastic.

In the handling of foodstuffs special demands are made on containers in respect of their hygienic properties, on the one hand in connection with the packaging of foodstuffs and, on the other hand, in connection with the consuming of foodstuffs. Particularly great demands are made in connection with the handling and packaging of sensitive foodstuffs, such as milk.

SE-B-412,357 discloses a container of paper, which is a parallelepiped and in which a tubular duct means in a connecting portion between two side walls is arranged. Owing to the shape of the container and the inherent rigidity of paper a self-supporting container is formed. The duct means consists of an internal layer of a non-sealable material and an external layer of a sealable material, which at one end extends beyond the non-sealable material to enable sealing of the duct means. The rigidity of the paper and the shape of the container also result in the cross-sectional shape of the duct means in the container following the side walls to form practi-

cally an elongate opening or slot when emptying the container.

This container is of the type that is made and filled simultaneously by making containers from below from a filled "tube" of container material. Devices for making and filling such containers are very large and expensive and therefore suited for large-scale operation only.

It is difficult to make such a tubular duct means, whose internal layer at one end is terminated inside the external layer. Moreover, it is an extremely complicated operation to insert a duct means between the side walls of the container when forming this in a filled state.

Heavy demands are currently made on containers in terms of their environmental influence. It should be possible to make and transport containers with a low consumption of energy and, after use, take care of them in an environmentally friendly manner. Further, consumers require that the container be easy to handle.

The container according to SE-B-412,357 is in itself difficult to handle since a user holding the container in its filled, open state runs the risk of spillage by squeezing the side walls of the container.

Moreover, the container comprises a plurality of materials, such as paper, polyethylene and aluminium, which makes it difficult to take care of the container waste in an environmentally friendly manner.

In spite of the presence of a large amount of different containers there is a need for a new kind of container which in a better way satisfies the various demands that are currently placed on containers.

Summary of the Invention

An object of the present invention is to provide a new and improved container. Special objects are to provide a container which can be made at low cost, has a low weight and is easy to handle.

A specific object is to provide an improved container for foodstuffs, especially for foodstuffs for which asepsis is necessary.

A further object is to provide a new and appropriate method of making a container.

Besides, an object is to provide an improved method and device for packing a liquid or pulverulent substance.

According to the invention, these and other objects, which will appear from the following specification, are now achieved by a container, a method and a device for making a container, as well as a method and a device for filling a container, which are of the types defined by way of introduction and in addition have the features stated in the characterising clause of claims 1, 14, 22, 26 and 29, respectively.

According to a first aspect, the invention thus resides in a container with flexible walls which are interconnected to form a closed compartment, the volume of which is dependent on the relative position of the walls. Two opposing side walls are joined along a common connecting portion, and the container has a duct means, the material composition of which is uniform along its entire length and which extends between the two side walls from the compartment to the outside of the container and is sealed when the container is in an empty state before filling.

By a duct means being formed between the compartment and the outside of the container, a strong opening of a predetermined size is formed. As a result, it will be easy on the one hand to fill the container and, on the other hand, in consumption, to empty the container since the size and position of the opening are predefined. Moreover, it will be possible to close and open the container several times, on the one hand when making and filling the container to ensure good hygiene and, on the other hand, in consumption to ensure good keeping qualities and taste, which is a great advantage in foodstuffs,

especially in foodstuffs for which hygiene and asepsis are necessary.

A great advantage of the inventive container is that making and filling thereof can take place in completely separate plants, and that this makes the container well suited for small-scale industry.

As mentioned above, the duct means is sealed when making the container. Provided that the container is made in sterile conditions or is sterilised after manufacture, an unfilled container with a sterile compartment can thus be obtained. This container can then be conveyed to a separate filling plant with maintained sterility. Therefore the filling plant need not comprise equipment for sterilisation of the compartment of the container, which is cost-effective and particularly advantageous for small-scale filling plants.

By the container having flexible walls, it may, when finished, be flattened and transported in flat state in a most space-saving manner.

Thanks to the combination of the container having flexible walls, which yields a collapsing container, and a duct means, a container for foodstuffs is provided, which besides before filling and after consumption can be pressed together and is extremely space-saving.

The duct means has a flexible wall, which makes it possible to press the entire container together. On the one hand, space can be saved and, on the other hand, the handling in manufacture and filling is simplified.

In a preferred embodiment, the duct means is made of the same material as the side walls, which is a great advantage when disposing of the container after use.

Moreover, the duct means can be integrated with the side walls or be formed as a separate piece inserted between the side walls.

The container is made of a flexible material, especially a plastic material. The plastic material advantageously comprises heat sealable surface layers. The

thickness of the material preferably is in the range 100-200 μm. The duct means can be made with a greater thickness than the walls, for instance about 200 μm when the walls have a thickness of about 100 μm.

According to an embodiment, the duct means is along essentially half its external circumference connected with one side wall of the connecting portion and along essentially the other half of its external circumference connected with the other side wall of the connecting portion. This results in a stable and symmetric connection of the duct means. This embodiment is especially advantageous when the duct means has a flexible wall since, when handling an empty container, a straight connecting portion with a flat duct means arranged therein is obtained.

In a particularly preferred embodiment, the duct means comprises on its inside a heat sealable material, which facilitates sealing of the duct means to close the same in an optional position along the duct means.

In a preferred embodiment, the duct means extends a distance away from the edge and is terminated with a terminal edge arranged on the outside of the container. This terminal edge can be sealed when making the container, in which case the container in empty and flat state can easily be sterilised and remain sterilised until it is to be filled. Before filling, the container can be opened by the terminal edge being removed, for instance cut off, and after filling, the new terminal edge can be sealed to close the container. When the contents of the container then are to be consumed, the duct means can once more be opened by cutting off the terminal edge. A great advantage of the duct means is that it can be sealed by the consumer by inserting a plug into the duct means at its terminal edge.

The container described above is well suited especially for consumer products having a volume of up to a few litres and a weight of up to a few kilos. It is particularly suitable for foodstuffs such as milk.

In another embodiment of the container, the separately manufactured duct means extends a distance inwards from the connecting portion to an inner end, the side walls comprising a projecting portion or appendage which surrounds the duct means and in which the connecting portion on each side of the duct means has a curved portion and an edge portion extending from the curved portion in parallel with the duct means. Thus an annular space forms round the duct means.

When the container in filled state is positioned with the duct means directed downwards, a radial pressure is exerted on the duct means, and when a tubular valve means is inserted in the duct means, a sealing effect is thus established between the duct means and the valve means. The container according to this embodiment is particularly suitable for cooperation with dispensers for serving a liquid such as water. It is particularly preferred in this embodiment that the inner end of the duct means is sealed when the container is filled.

According to a second aspect, the invention provides a method for making a container for liquid or pulverulent contents, comprising the steps of making the container before filling, forming a duct means between two opposing side walls so that the duct means extends from the compartment of the container to the outside of the container, joining the two side walls along a connecting portion, and sealing the duct means.

In an embodiment of the manufacturing method according to this second aspect, the side walls are separated before arranging the duct means therebetween. In a special embodiment, the duct means is inserted between the side walls while advancing the container as well as the duct means in a common direction of travel. This renders rational and rapid mounting of the duct means possible. Preferably, a plurality of containers are manufactured and advanced in a web, a plurality of duct means being supplied to the web to be arranged between the side walls

of the containers in the web. It is a considerable advantage that the container can be made in large series in this way since this results in low manufacturing costs.

According to a third aspect, the invention provides a device for making a container. The device comprises an assembly station, which is adapted to form a duct means between the side walls so that it extends from the compartment to the outside of the container, and comprises a first connecting device for joining the two side walls along the connecting portion and a second connecting device, which is adapted to seal the duct means. With this manufacturing device, a suitable device for making the inventive container and for carrying out the manufacturing method is provided.

According to a fourth aspect, the invention provides a method of filling a container. The method comprises the steps of opening from outside, by cutting or the like, a sealed duct means, which is formed between two side walls of the container and which extends from the compartment to the outside of the container, inserting a filling nozzle in the duct means, and introducing through the filling nozzle the contents into the container while simultaneously increasing the volume of the compartment by separating the walls. As a result, a method is provided, which is well suited especially for packing sensitive foodstuffs in containers which have been sterilised in advance.

According to a fifth aspect, the invention provides a device for filling a container. The device comprises an opening means, which is adapted to open, by cutting or the like, a sealed duct means, which is formed between the side walls of the container and which extends from the compartment to the outside of the container, and a filling nozzle, which is arranged in the end of the filling duct and has a tapering end portion which is elongate in cross-section, to be inserted in the duct means after opening thereof. With this device, hygienic filling with

a liquid is achieved, and during filling the liquid cannot contact the surroundings.

In a preferred embodiment, the filling nozzle is made of an elastic material. It is particularly preferred that the filling nozzle in the end portion has an elongate outlet with edge portions which are directed to each other and which preferably engage each other to seal the outlet in the absence of application of outer forces. As a result, liquid is prevented from contacting the surroundings before and after filling a container.

In a particularly preferred embodiment, the filling device comprises a chamber which in filling surrounds the duct means and the filling nozzle, to ensure a clean environment round these by letting a clean gas flow on their outside.

In one more preferred embodiment, the filling device is provided with a squeezing member acting on a deformable tube, which is included in the filling duct, to control the flow in the filling duct. This results in a valve means with smooth internal surfaces which prevent bacteria from collecting and thus ensure an aseptic environment.

Finally, a container is provided, which is filled with liquid or pulverulent contents by using the above-described filling method or filling device.

With the container system according to the above aspects of the invention, considerable improvements have thus been achieved when packing liquid foodstuffs. The container is consumer-friendly and is suited to be manufactured in a cost-effective manner and be sterilised in advance since it is flat and collapsed in empty state, and therefore its compartment is essentially empty of gas as well. A great advantage is also that the container is sealed in this state. Manufacture, sterilisation and filling can be carried out in different places and at different times while maintaining good hygienic condi-

tions. The flexibility of the process up to a completed, filled container will be great.

Brief Description of the Drawings

The invention will now be described in more detail with reference to the accompanying drawings, which for the purpose of exemplification illustrate preferred embodiments of the invention and in which

Figs 1 and 2 are perspective views of a first embodiment of a filled container according to the invention;

Figs 3 and 4 are perspective views of a second embodiment of a filled container according to the invention;

Fig. 5 illustrates a container in empty state arranged in a web, a portion of a neighbouring container being shown;

Fig. 6 illustrates on a slightly reduced scale a container according to Fig. 5 with parts removed to illustrate the composition of the container;

Fig. 7 is a cross-sectional view along line V-V in Fig. 5;

Fig. 8 is a detail view of a special embodiment of a handle of the container;

Fig. 9 is a perspective view of a third embodiment of the container in filled state;

Fig. 10 is a longitudinal section of the container shown in Fig. 9 in open state;

Fig. 11 is a longitudinal section perpendicular to the section shown in Fig. 10 and illustrates the container in closed state and a device for sealing thereof;

Fig. 12 is a perspective view of the manufacture of containers according to the invention;

Fig. 13 illustrates in more detail a manufacturing step when making the container;

Fig. 14 is a side view of a device for filling a container, certain parts being removed for better clarity;

Fig. 15 is a longitudinal section, along the direction of travel of the containers, of the device shown

in Fig. 14 for filling a container, certain parts being removed for better clarity;

Fig. 16 is a view of a sterile environment rail in a view along line XIV-XIV in Fig. 15;

Fig. 17 is a cross-sectional view of the sterile environment rail according to Fig. 15 along line XV-XV in Fig. 15;

Fig. 18 is a cross-sectional view of a device for sealing a filled container;

Fig. 19 is a sectional view along line XVII-XVII in Fig. 18;

Fig. 20 is a side view of a filling nozzle; and

Fig. 21 is a longitudinal section of the filling nozzle according Fig. 20 along line XIX-XIX.

Description of Currently Preferred Embodiments of the Invention

Container

The container 10 will now be described with reference to Figs 1 and 2, which illustrate a first preferred embodiment of the container in filled state seen obliquely from above and obliquely from below, respectively. The container 10 is intended for liquid of pulverulent contents and is particularly suitable for foodstuffs requiring a high degree of hygiene and asepsis, such as milk. The container is of the collapsing type, i.e. of compressible or foldable type, and comprises three flexible walls, viz. two opposing side walls 12 and a bottom wall 14, which are made of a plastic material and interconnected to form a compartment, the volume of which is dependent on the position of the walls 12, 14. The two side walls 12 are welded together along a common connecting portion 20. A separate duct means 16, which is also made of a flexible plastic material, is formed between the side walls 12 transversely of the connecting portion 20 and extends from the compartment to the outside of the container 10, on the opposite side of the container 10 in relation to the bottom wall 14.

The duct means 16 is tubular and has a flexible wall of a material and quality similar to that of the side walls 12. A duct means without a longitudinal seam, for instance an extruded tube, is particularly preferred. The side walls 12 form a common edge from which the duct means 16 projects perpendicularly a distance and is terminated with a terminal edge 18 which is arranged on the outside of the container and which is sealed by the internal surfaces of the duct means 16 being welded together. The container 10 can easily be opened by the sealed terminal edge 18 being cut off, for instance with a pair of scissors. Then the container 10 can be resealed by inserting a plug (not shown) in the duct means.

A carrying means 30 is arranged in the connecting portion 20 at a first side of the duct means 16 and consists of an opening area 32 which comprises a first essentially round opening 34 and a second essentially elongate opening 36. As a result, the carrying means forms a handle 30 which makes it possible for the user to carry the container 10 with four fingers while at the same time a force-absorbing portion forms between the openings so that the handle 30 does not fold or is not deformed in any other way when the container 10 is being carried. The two openings 34, 36 of the handle 30 extend at an angle of about 25° to a vertical line through the container 10. Experiments have shown that an angle in the range 20-30° yields comfortable handling of the container 10. On the opposite side of the duct means 16, the connecting portion 20 is designed as a tab 22 to facilitate opening and closing of the container 10.

Figs 3 and 4 illustrate a second preferred embodiment of a container 10' in filled state.

The container 10' differs from the one shown in Figs 1 and 2 only by the duct means 16 being integrated with the side walls of the container. The side walls 12' of the container are each formed with a projection U, which when welding together the side walls 12' along the

connecting portion 20' forms said duct means 16'. It is true that the duct means 16' will not be as rigid and easy to handle as the duct means formed as a separate member which is inserted between the side walls, but on the other hand a duct means 16' according to the second embodiment allows a more rational manufacture of the containers 10' since one manufacturing step, i.e. the insertion of the duct means between the side walls, can be eliminated.

Fig. 5 shows an empty container 10 according to said first embodiment and a portion of a trailing container, which are made in a web as will be described in more detail below. A number of connecting surfaces are also to be seen.

Fig. 6 illustrates on a slightly reduced scale the container 10 shown in Fig. 5 with the nearest side wall removed. The figure thus shows the inside of a farther side wall 12, a duct means 16 connected therewith, a bottom wall 14 folded along a fold line 15, and the design of the connecting portion 20, along which the two side walls 12 are interconnected. In the bottom area 42 of the container 10, the side walls 12 are connected with the bottom wall 14 on the hand via a lower connecting portion 24, along which each side wall 12 is connected to the bottom wall 14 and, on the other hand, via two lateral connecting portions 26, along which all three walls 12, 14 are interconnected by a common welding seam. The compartment 40 of the container 10 thus is defined by the side walls 12 and the bottom wall 14. The connecting portion 20 forms boundary lines 28 facing the compartment 40.

The duct means 16 is arranged on the opposite side of the container 10 in relation to the bottom wall 14. This design results in a container from which a liquid can be poured in a comfortable manner.

The compartment 40 comprises an above-mentioned bottom area 42, a central area 44, in which the boundary

lines 28 associated with the connecting portions 20 and facing the compartment are parallel, and an upper arched area 46, in which the boundary lines 28 extend arcuately towards each other to the inside edge of the duct means 16. With this design, the container 10 stands stable independently of the extent to which it is filled.

The tubular duct means 16 is flat and, in a portion 25 arranged in the connecting portion 20, connected to one side wall 12 along half its external circumference and to the other side walls 12 along half its other external circumference. On the inside of the container 10, the duct means 16 extends transversely of the entire connecting portion 20 to the compartment 40.

Fig. 7 is a cross-sectional view of the container 10 according to said first embodiment, from which it is evident how the various parts 12, 14, 16 of the container 10 are welded together. The container 10, which is shown in empty state, is sealed for maintained cleanness before filling. At the upper end of the container 10, the terminal edge 18 of the duct means 16 is sealed by its internal surfaces being welded together. The side walls 12 are with their internal surfaces welded together with the external surfaces of the duct means 16 in the connecting portion 20. It is important for the internal surfaces of the duct means 16 not to be welded together in the area of the connecting portion 20 when the side walls 12 and the duct means 16 are being connected with each other, which is advantageously achieved by hot sealing. To ensure this, it is preferred for the duct means 16 to have a greater wall thickness than the side walls 12, so that heat applied from outside by hot press jaws can weld the side walls 12 and the duct means 16 together before the heat has reached the inside of the duct means 16. In an alternative embodiment, the inside of the duct means 16 can be coated with a material which has a higher melting point than the materials in the joint 20 between the duct means 16 and the side walls 12.

In case the duct means 16' is integrated with the side walls 12' of the container 10', as is the case with the container 10' according to said second embodiment, the manufacture of the duct means 16' is most simple. A sealing tool (not shown) for welding together the side walls 12' is designed so that the duct means 16' forms in connection with the welding together of the side walls 12' along the sealing portion 20'. The duct means can thus be made with the same wall thickness as the side walls, and moreover no internal material with a higher melting point is required.

In the lower area of the container 10, the bottom wall 14 with its upwardly directed fold line 15 and the two side walls 12 are shown, which are joined with the bottom wall 14 in a welding seam along the lower connecting portion 24.

Fig. 8 shows a special embodiment of the carrying means or handle 30 of the container. A deformation zone 50 is to be seen, comprising a deformation area 54, 56 at each one of the two openings 34, 36. Each deformation area 54, 56 is formed of a portion, in which the two juxtaposed side walls 12 are not interconnected. Thus the deformation areas 54, 56 will have great flexibility and extend along the side of the opening area 32 facing the edge. The deformation areas 54, 56 are deformed if the user holds the container 10 in the opening area 32 with his hand. Thus, the side walls 12 round the opening area 32 are prevented from cutting into the user's hand.

Furthermore, Fig. 8 illustrates a stiffening means in the form of a gas-filled duct 52, which is arranged between the opening area 32 and the edge of the connecting area 20. This results in great rigidity of the carrying means 30 although the side walls 12 are made of a flexible material. By the duct 52 being filled with gas, preferably air, no further material is supplied, which would make the container 10 heavier and complicate the handling of the container 10 after use.

The containers illustrated in Figs 1-8 are in filled state intended to be stored standing and are suited especially for consumption of liquid foodstuffs, such as milk and juice. A preferred size is about 1-3 l.

Fig. 9 shows a third embodiment of a container 110 according to the invention. In this design, the container 110 is adapted to be suspended for dispensing its contents and is especially suited for larger amounts of about 5-15 l and use in dispensers. A preferred field of application is in drinking-water dispensers. The composition of the container 110 largely corresponds to the above-described first embodiment of the container. The differences are above all that the container 110, compared therewith, is used in the inverted position and thus has an upper wall 114 corresponding to the bottom wall 14 and a duct means 116 arranged at its lower end.

The upper wall 114 is, together with the side walls 112 of the container 110, extended upwards to form two carrying means 130 which comprise flaps 132 and openings 134 formed therein. Consequently, the container 110 can be suspended from holding sticks 60 in connection with storage, transport and dispensing.

Fig. 10 illustrates the design of the container 110 at its lower end, the nearest side wall 112 being removed for good clarity and the duct means 116 being shown in longitudinal section. It is apparent that, in the same manner as described above, the duct means 116 is along one half of its circumference connected with one side wall 112 and along the other half of its circumference connected with the other side wall in the connecting portion 120 of the container 110. However the duct means 116 extends in this embodiment a distance into the compartment 140 of the container 110 from the connecting portion 120. At the same time the side walls 112 form a projecting appendage portion 113 which surrounds the duct means 116 to form an annular projecting blind duct 142 round the duct means 116 in the compartment 140.

The connecting portion 120 is connected with the duct means 116 transversely thereof and has, on each side of the duct means 116, a curved portion 122 and an edge portion 124 extending from the curved portion 122 in parallel with the duct means 116.

In the shown position, the duct means 116 is in position to be emptied or filled, the duct means 116 being open both at its inner end 117 and at its outer end 118. In connection with the manufacture of the container 110, the outer end 118, however, is sealed. In connection with filling, the container is opened by cutting off the sealed end 118.

After filling, the container 110 is closed by the inner end 117 of the duct means 116 being sealed, as shown in Fig. 11, which shows the duct means 116 in a longitudinal section perpendicular to the one shown in Fig. 10. A pair of hot press jaws 70 are pressed against the side walls 112, as indicated by double arrows 72. The Figure illustrates a stage immediately after that. To prevent the side walls 112 from being connected with the duct means 116, the internal surfaces of the duct means 116 are preferably made of a material with a lower melting point than the internal surfaces of the side walls 112 and the external surfaces of the duct means 116.

When at a later stage the container 110 is to be emptied, the duct means 116 is opened with a stabbing means to the position as shown in Fig. 10. Then the container 110 can be emptied with the aid of a valve means (not shown) having a cylindrical circumferential surface and inserted into the duct means 116. Then liquid in the projecting blind duct 142 will under pressure press the duct means 116 against the valve means and thus seal against leakage.

The container according to the embodiments of the invention as described above can be made of an optional flexible material, plastic being preferred. Such plastic materials are especially preferred as are heat sealable

in any case in the relevant surface layers. A preferred plastic material comprises a body layer of polyolefin material with a filler, preferably chalk. This material has been found to yield good barrier properties, especially against gases, at low cost. It is also possible to arrange a gas barrier of EVA or EVOH. The thickness of the material of the containers is preferably in the range 100-200 μm.

Manufacture of the Container

Below follows a description of the manufacture of a container of the type that has been described above with reference to Figs 1 and 2. Fig. 12 shows how the walls of the container are joined to a common web. Two identical side wall webs 212 are conducted in a parallel, opposite relationship along a production line. At the same time a bottom wall web 214, which is folded to a double-wall shape, is inserted between the two side wall webs 212.

Fig. 12 shows an assembly station 240 and how the three plastic webs 212, 214 are joined and interconnected at a connecting station 220 by heat sealing to form a container web 210. The heat sealing operation is accomplished by hot press jaws 218. At a punching station 225, handles and portions of material arranged between the containers are punched.

Then the container web 210 reaches an insertion device 250, by which duct means are mounted. A tubular web 216 is unwound from a duct storage coil 209 and cut to duct means 16, which are then inserted between the side walls of the web by the insertion device 250 to form completed containers 10 in the container web 210, which is wound into a storage coil 230.

Fig. 13 illustrates parts of the assembly station 240 in more detail, from which it is evident how the tubular web 216 is fed by means of a feeding device 242 into an insertion device 250 and cut to duct means 16 of a suitable length by means of a cutting device 246.

The insertion device 250 comprises a circular insertion wheel 251, which is operated intermittently by a driving motor 348 and has a holding slot 252 which extends along the circumference of the wheel 251 and in which the duct means 16 are held.

The circumference of the insertion wheel 251 further extends in an insertion position adjacent to the container web 210 to insert the duct means 16 between the side walls 12 of the containers 10. The assembly station 240 comprises a separating device 260 to separate the side walls 12 when inserting the duct means 16. The separating device 260 comprises two vacuum rolls 262, one on each side of the container web 210, which are located at a distance from the web 210 and connected to a vacuum assembly (not shown). On the circumference of the vacuum rolls 262 apertures 264 are formed, to which suction is applied by the vacuum assembly, causing the side walls 12 to be separated, as shown.

Moreover the assembly station 240 comprises a first connecting device 270 and a second connecting device 280. The first connecting device 270 has two hot press jaws 272, one on each side of the container web 210, to join the two side walls 12 with each other and with the duct means 16 along the open connecting portion 20. The second connecting device 280, which is arranged downstream of the first connecting device 270, also has two hot press jaws 282, which are arranged each on one side of the inserted duct means 16 for sealing thereof.

The suction force from the vacuum rolls 262 is applied while moving both the container web 210 and the circumference of the insertion wheel 250 in the direction of travel of the web 210, so that the duct means 16 is inserted obliquely between the side walls 12. When the duct means 16 is perpendicular to the web 210, both the web 210 and the insertion wheel 250 are stopped, and the suction to the vacuum roll 262 is interrupted.

In this stationary position, the press jaws 272 of the first connecting device 270 are pressed against the outside of the side walls 12. At the same time, a new piece of tube 216 is inserted, on the other side of the insertion wheel 250, into the slot 252 of the wheel 250 and is cut to form a new duct means 16. The idle time is also used by the second connecting device 280 which simultaneously seals the duct means 16 and, thus, the associated container 10 at a stage located downstream.

In addition to the components mentioned above, the device for making containers comprises a feeding device 290 in the form of two rollers 291 and an indexing device (not shown) for controlling the feeding so that a correct positioning of the duct means 16 is ensured. In an alternative embodiment, the external end of the duct means 16 can be sealed before the duct means 16 is inserted between the side walls 12.

As shown in Fig. 12, the completed containers 10 are wound into coils 230. A great advantage of the containers 10, "especially" when used for foodstuffs, is that they can be sterilised by radiation in an extremely simple manner by exposing the coils 230 to axially directed radiation, in which case the radiation that passes through the inside of the containers 10 merely need to penetrate joints in the axial end portions (not shown) of the coil 230.

Filling of the Container

Fig. 14 is a side view, in the direction of travel, of a device 300 for filling a container 10 of the type as described above with reference to Figs 1 and 2 preferably with a liquid. The device will be described below with reference to milk, but it is suited also for filling with other liquids and pulverulent substances.

The filling device 300 comprises a carrying means 310, a filling duct 315 which is connected to a storage tank (not shown) and consists of a deformable tube 320 with a filling nozzle 325 at its lower end, and a squeezing means 330 which is arranged round a throttle portion

322 of the tube 320 and which comprises a supporting device 331 arranged at a first side of the tube 320 and a squeezing member 332 arranged at the opposite side of the tube 320. A plurality of components have been removed from the filling device 300 shown in Fig. 14 for better clarity.

The supporting device 331 of the squeezing means 330 is fixedly connected to the carrying means 310 and forms a concavely curved squeezing surface 333 facing the tube 320. The squeezing member 332 is circular and suspended from the carrying means 310 in an asymmetrically pivotable manner. Thus, the squeezing member 332 forms a convex squeezing surface 334 facing the tube 320 and the supporting device 331. The squeezing member 332 is pivotable in the manner indicated by the double arrow 335 and thus opens the duct 315 by a combined motion downstream and outwardly away from the tube 320 and closes the duct 315 by a combined motion upstream inwardly towards the tube 320. By closing occurring in a combined squeezing motion and upstream motion, a subatmospheric pressure is generated in the tube 320 downstream of the squeezing means 330, thereby preventing dripping from the filling nozzle between filling operations.

The filling device 300 also comprises a control means (not shown) which controls the opening and closing of the duct 315 with the aid of the squeezing means 330. The control means is also connected to a meter (not shown) for measuring the amount of liquid that has passed. The control means is arranged to start measuring at the same time as the duct 315 opens and to close the duct in response to a predetermined amount being measured. The meter can be designed in one of several ways, for instance for weighing the container 10 during filling, measuring the volume that flows through the duct 315 or measuring the time that passes after the duct 315 has been opened.

The carrying means 310 which carries the tube 320 and the squeezing means 330 is vertically adjustable in a frame 340 in such manner that the filling nozzle 325 can be inserted into a container 10 to begin the filling operation and can be removed from the container after filling.

On the frame 340 there is arranged an opening means 350 in the form of two pivotable opening arms 352, at the ends of which suction cups 354 are mounted. The suction cups are connected to a vacuum source. By pivoting, by means of the opening arms 352, the suction cups 354 to the sides of the duct means 16 of the container 10 and then applying suction to the suction cups 354 while at the same time the opening arms 352 are pivoted slightly outwards, the duct means 16 opens so that the filling nozzle 352 can be inserted into the same, which is effected by moving the carrying means 310 downwards.

Fig. 14 also shows a pair of conveying arms 345 which are arranged on rotatable conveying rods 346 which are adapted to reciprocate. When conveying a web 210 of containers 10, the conveying arms 345 are pivoted to engage the web 210, whereupon the conveying rods 346 perform a striking motion in the travelling direction of the web 210 to move the web 210. Subsequently, the conveying arms 345 are pivoted away from the web 210 and the conveying rods 346 are returned to the starting position to repeat the procedure.

The filling nozzle 325, which is shown in more detail in Figs 20 and 21, has an end portion 326 of elongate cross-section, which in its transverse direction tapers off to an elongate outlet 27 with opposing edge portions 328 which engage each other. The end portion 326 also tapers slightly in the longitudinal direction of the elongate cross-section, as is evident from Fig. 20. The filling nozzle 325 is made of an elastic material, preferably a plastic, for instance silicone rubber, and is self-closing, i.e. the edge portions 328

of the outlet 327 engage each other to seal the outlet 327 in the absence of application of outer forces. The filling nozzle has at its end facing away from the end portion 326 a connecting portion 329 to be connected to the filling duct 315. A thus designed filling nozzle 325 is particularly suitable to be inserted into the duct means 16 of the container 10 and seal against the inside thereof.

Fig. 15 is a side view of a filling device 300 like the one shown in Fig. 14. There is shown a chamber 360 which is arranged round the filling nozzle 325 and the duct means 16 of the containers 10, said chamber comprising a rail 362, in which the duct means 16 is guided, a bellows 364 surrounding the filling nozzle 325, and a delivery duct 366 for sterile gas, such as hot sterile air.

Fig. 15 shows a web 210 of containers 10, which are conducted into a filling device 300 in the direction of arrow 3, which is the travelling direction of the web. In position A, a closed container 10 is shown, whose duct means 16 is sealed in its outer end portion 18. An opening means in the form of a cutting device 370 with a motor 374 and a rotating cutting blade 372 which is arranged on each side of the web 210 and of which only one is shown, is arranged in the rail 362 to open the container 10 by cutting off the sealed end portion 18 of the duct means 16.

After the cutting device 370, seen in the direction of travel 3, the filling nozzle 325 of the filling duct 315 is arranged, and one step further, a sealing station 380 which is shown in more detail in Figs 18 and 19 is to be found, comprising two hot press jaws 382, which are also shown in Fig. 16 and mounted on holding arms 284 to seal the duct means 16 of the filled containers 10.

The rail 362, the appearance of which is shown in more detail in Figs 16 and 17, is elongate and has an essentially vertical rectangular cross-section with a

slot 363 which is formed in its underside and in which the duct means 16 is guided. The slot 363 is adjacent to the filling nozzle 325 expanded to an elliptic opening 365 to allow opening of the duct means 16 and insertion of the filling nozzle 325 into the same. Furthermore, the rail 362 comprises adjacent to the filling nozzle 325 a cylindrical connecting portion 368 arranged on its upper side and intended for the bellows 364.

In operation of the filling device 300, sterile gas flows into the bellows 364 through the delivery conduit 366 and further into the rail 362. The gas then escapes through the slot 363. The bellows 364 permits a sterile environment round the filling nozzle 325 while at the same time the nozzle can be raised and lowered unimpededly. With the chamber 360 it is ensured in an easy and reliable manner that filling occurs in a sterile environment.

When filling an empty and previously sterilised container 10, it is first inserted into the sterile environment in the rail 362, whereupon the collapsed and empty container 10 is opened in the cutting device 370. The open container 10 is then conveyed to the filling nozzle 325, adjacent to which the opening means 350 expands the duct means 16 and the filling nozzle 325 is inserted into the same. In this connection, the squeezing means 330 opens and the container 10 is filled with milk, which increases the volume thereof, the meter beginning to measure the amount of liquid supplied to the container. When a predetermined amount has been measured, the squeezing means 330 closes in response thereto. When closing, a subatmospheric pressure forms in the tube 320 adjacent to the filling nozzle 325, and therefore its outlet opening 327 is sealed. The container 10 is then conveyed further to the sealing station 380 where it is sealed once more.

Owing to the fact that unclean air from the environment will not on any occasion get a chance to enter the container 10 after sterilisation, an extremely hygienic

environment will be obtained for the liquid contained in the container 10.

When cleaning the filling device 300, the rail 362 together with the bellows 364 is removed by means of a releasing device 367. These parts are then cleaned in a separate bath. A cleaning cup (not shown) with a tube connection is mounted round the filling nozzle, whereupon a cleaning agent is circulated in the filling duct 315 and round the filling nozzle 325. Then the cleaning cup is removed, and the rail 362 with the bellows 364 is mounted once more. The slot 363 of the rail 362 is then sealed in a gas-tight manner with the aid of a collecting means which has an outlet, whereupon the filling nozzles 325 are moved down to the filling position and sterilisation with hydrogen peroxide (H_2O_2) is carried out, the gas being supplied through the inlet 366 and discharged through the outlet of the collecting means. After removal of the collecting means and having allowed milk to flow through the filling duct 315, the production can be begun again. Thus, the filling device is easy to keep clean and to clean, thereby ensuring good hygienic conditions.

Although merely devices for making and filling a container having a separate duct means inserted between its side walls have been described, it will be appreciated that by making suitable modifications, these devices can also be used to make containers, whose duct means is integrated with the side walls of the container. The scope of the invention thus is defined only by the appended claims.